Jan. 11, 1944. H. ROSENTHAL 2,338,970

FLUORESCENT TUBE SOCKET

Filed Oct. 31, 1941 2 Sheets-Sheet 1

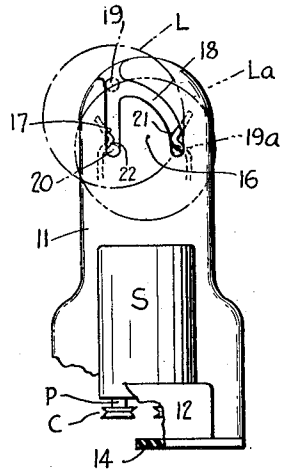


Fig. 1.

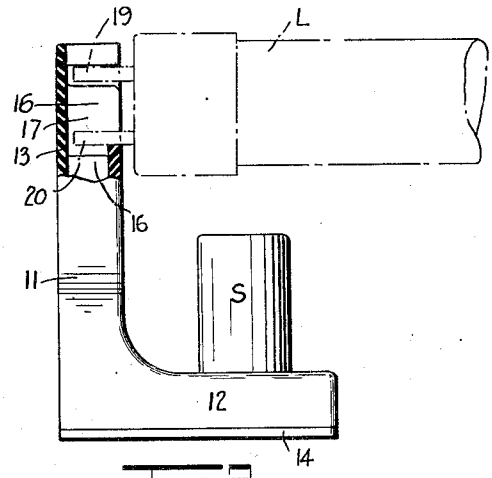


Fig. 2.

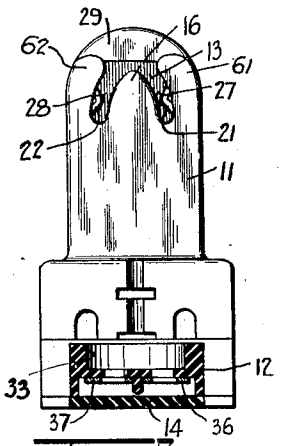


Fig. 3.

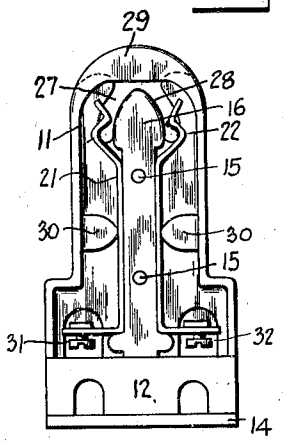


Fig. 4.

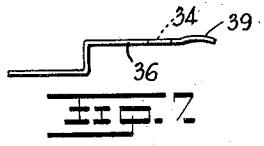


Fig. 7.

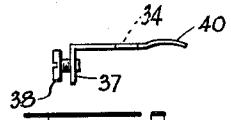


Fig. 8.

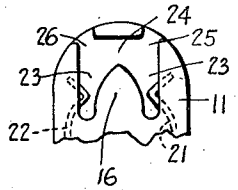


Fig. 9.

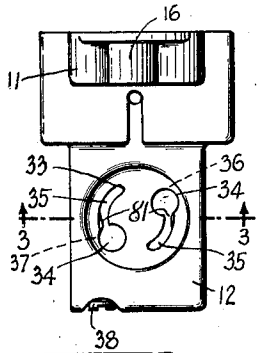


Fig. 5.

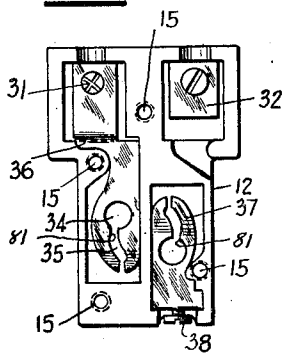


Fig. 6.

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FLUORESCENT TUBE SOCKET

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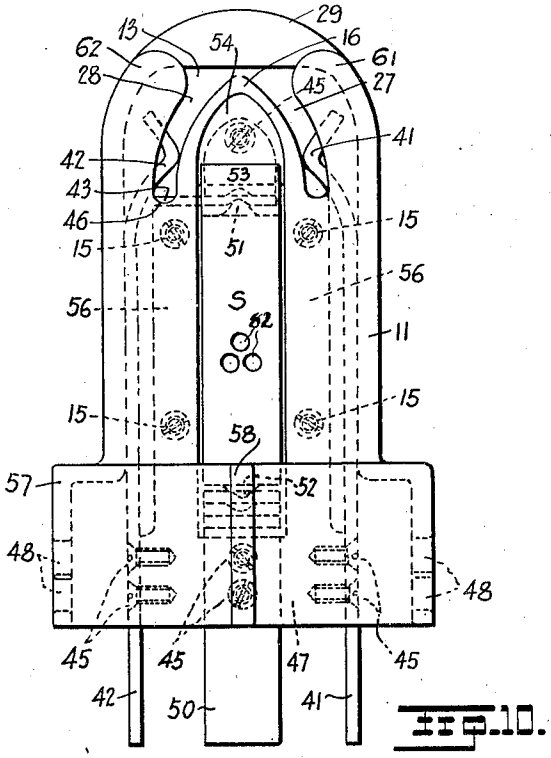


Fig. 10.

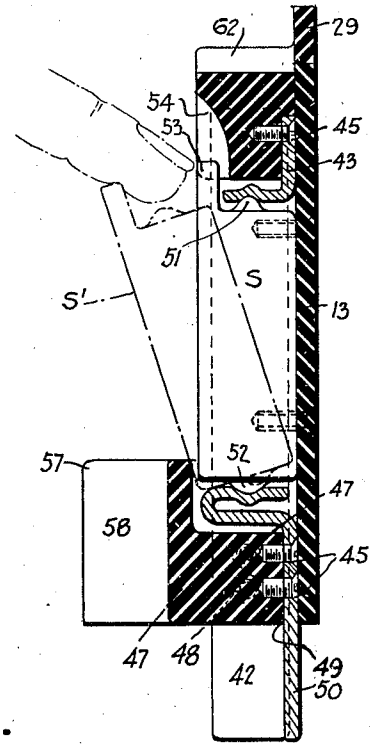


Fig. 11.

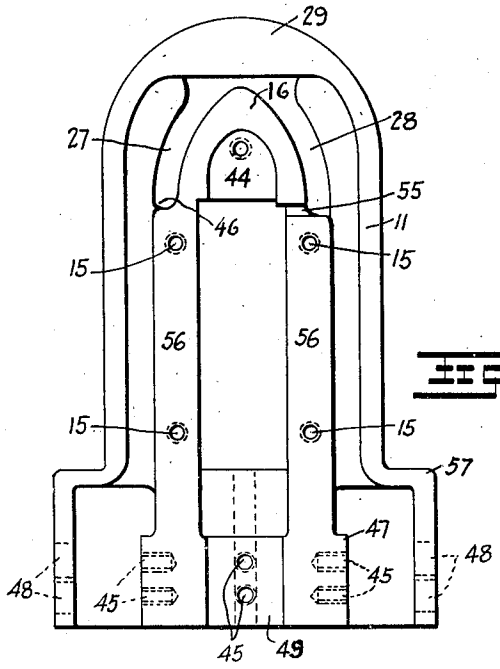


Fig. 12.

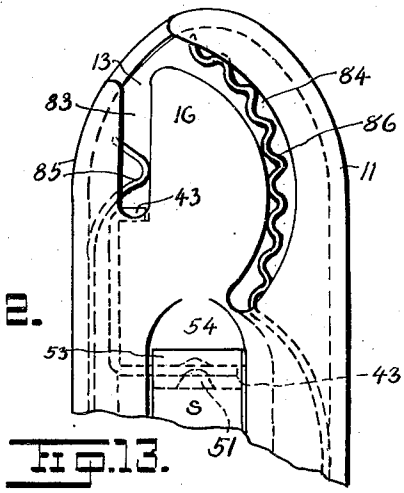


Fig. 13.

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Patented Jan. 11, 1944

2,338,970

UNITED STATES PATENT OFFICE

2,338,970

FLUORESCENT TUBE SOCKET

Harry Rosenthal, Belle Harbor, N. Y.

Application October 31, 1941, Serial No. 417,377

2 Claims. (Cl. 173—328)

This invention concerns an electric socket for lamps or tubes, as they are for instance known as fluorescent tubes. That name generally applies to a certain type of gaseous conduction lamp and a starter relay or tube controlling it, which are provided with prongs or prongs having a collar, the latter finding particular use in connection with the starter relay or tube. A fluorescent tube is ordinarily provided with terminals or prongs at its opposite ends, usually two prongs per end. It has been found convenient to provide a socket for each end, said sockets being predeterminedly spaced apart, and the luminescent tube being slid in sideways or from the top, the socket also accommodating a starter relay or tube, for instance below the luminescent tube.

Lamps and tubes of this type have rapidly come into commercial use, and the sockets used in connection therewith are faulty as to electrical and mechanical performance and safety, and are also lacking from a point of view of convenience of handling. Thus the tubes would require nimble and expert manipulation, or several manipulations, for purposes of insertion in the socket, or for purposes of removal therefrom. If a tube is not properly handled for insertion or removal, it may break in the hand of the operator.

Such disadvantages of the prior art are to be overcome by the instant invention. Generally, the required manipulation is to be simplified. A predetermined guidance for insertion is to be provided, fixedly allocating the device relately to the point of rotation. Thereupon rotation of the device places it into proper and secure contact. For instance, the lamp is not to fall out, even if the spring contactor should give way.

The invention further provides for the arrangement of contact media or springs in the socket in a protected position in which they are removed from accidental contact, or even from willful approach by parts of the human body. Thus damage to the equipment and fire hazards are avoided, and at the same time provisions are made for the safety of persons handling the equipment or coming close to it.

Furthermore a socket of this invention has the object of preventing the insertion of tubes or other electrical devices in such fashion that one of the terminals is electrically connected whereas another terminal might still be exposed outwardly to undesired contact.

One more object of this invention provides for a sliding upon reasonably broad surface into an ultimate position of contact, so that a reasonably large area of contact is assured for the electrical connection.

Other objects of this invention will be learned from the following exemplary explanation of the details of specific embodiment of the invention, which is rendered for the purpose of illustration, but not in limitation of the invention.

In the drawings:

Fig. 1 shows the front elevation of a device of this invention, which is partly sectioned away, where a starter S is inserted therein. A luminescent tube L is shown in dot-dash lines, once in a position of first insertion, and then again in a final position, the characters being in the latter position connoted by suffixes *a*.

Fig. 2 is a corresponding side view which is partly sectioned in the plane of the prongs of tube L, the latter being in its first position of insertion, and being shown to part of its length only.

Fig. 3 is the front elevation of another embodiment of this invention, which is cross-sectioned at the plane pointed out by dot-dash lines, arrows and numerals 3 in Fig. 5 herein.

Fig. 4 is a corresponding rear view in which the flat rear cover is removed.

Fig. 5 is a corresponding top view.

Fig. 6 is a corresponding bottom view, the flat bottom cover being removed.

Figs. 7 and 8 are corresponding side views, of the spring contactors shown in Fig. 6.

Fig. 9 relates to another embodiment, of which a portion near the top is shown in a front view.

Fig. 10 is a front elevation of an embodiment in which the starter relay tube is directly accommodated in the portion of the slots which serve to receive the fluorescent tube.

Fig. 11 is a corresponding side view, the device being cross-sectioned at the center.

Fig. 12 is a corresponding rear view of the housing only.

Fig. 13 is the front elevation of the upper portion of another socket in this invention.

Similar numerals refer to similar parts throughout the various views.

The device is shown to have a rear compartment 11 and a bottom compartment 12, to which are attached by suitable screws at 15 the rear and bottom covers 13 and 14, respectively. In the rear compartment 11 arises towards the back the backbone 16, which may run centrally to a point, as shown in connection with the embodiments illustrated in Figs. 3–12.

In the modification of Figs. 1 and 2, said backbone 16 is upwardly delimited at the left by a vertical slot 17 in the front of a compartment 11,

and at the top and on the other side by a slot 18 extending over a quadrant, merging at the top with slot 17, and disposed at a circle described by the prong 19 of a luminescent tube, when said prong 19 is swung around the other prong 20 of luminescent tube L, after said latter prong 20 has been inserted into an end or bottom position in vertical slot 17.

For operation a mate of the electrical socket illustrated in Figs. 1 and 2 is arranged opposite to the socket shown at a distance allowing the body of luminescent tube L to be lowered between said sockets, said mate being symmetrical with the electric socket shown, so that the slots 17 and 18 are in registering alignment. The prongs 19 and 20 at the opposite ends of a luminescent tube L are ordinarily also aligned in one plane, so that the luminescent tube L may be lowered straight down between the two electrical sockets, when the prongs 19 and 20 are disposed in a common vertical plane.

The spring contactors 21 and 22, are shaped at their upper ends, so that they normally block the two channels 17 and 18, the tension of the spring contactors forcing these curved upper ends onto the backbone 16 arising in the rear compartment 11, where the upper end of said backbone is delimited by the slots 17 and 18. When a prong 19 or 20 is forced down in one or the other of these slots, it pushes aside the upper end of the respective spring contactor 21 or 22, and is then firmly socketed below said upper end of the spring contactor at the bottom of the respective slot. The mounting of the spring contactors conforms to the arrangement generally known in the art, i. e. the fixed lower ends of the spring contactors serve as binding posts for electrical connection. The arrangement of the device of Figs. 1 and 2 is similar in this respect to the details shown in the drawings in connection with the second embodiment, in respect to which a further explanation is given below (Figs. 3–8).

When, for purposes of mounting it in a pair of sockets, a luminescent tube L is pressed down, the prongs 19 and 20 being in vertical alignment and descending in slot 17, a stop will first be reached, in which the prong 20 is engaged in its ultimate position by spring contactor 22, such position of the device being shown in Figs. 1 and 2. Then the prong 19, which is above prong 20 in the vertical slot 17, is swung around prong 20 into and through slot 18 into the position 19*a*, which it has reached after pushing the free end of spring contactor 21 out of the way, being then firmly lodged below the projecting upper end of said spring contactor 21.

For purposes of removing a luminescent tube L the operation is reversed, i. e. prong 19 is first swung out of a position 19*a*, in which it is horizontally aligned with prong 20, around said prong 20 into a position of vertical alignment with said prong 20. Then the luminescent tube is vertically lifted out of slot 17.

Tubes S, which serve as starter relays, are normally provided with collars C at or near the ends of their pair of prongs P, such collars usually being provided with a V-groove, as shown, so that a clip of round wire, serving as a spring contactor, may engage in said groove, and will retain the tube S in the mounted position shown in Figs. 1 and 2. By necessity the contact of such a spring clip with the collar C must be a point contact, which is notoriously poor and unsatisfactory, and that is improved upon by spring contactors provided by this invention serving for engagement of tubes S as it is explained in detail below.

While the arrangement of the electrical socket for engagement upon the luminescent tube, as shown in the embodiments of Figs. 1 and 2, provides for particular safety and convenient handling, it involves the one disadvantage, that a mated pair of such electric sockets cannot be alike, unless there is a duplicate slot arrangement, which leads to the embodiment illustrated in Fig. 9. There a vertical slot 23 on each side and the curved cross-slot 24 allow the second prong to be swung out of either one of the vertical slots into the bottom of the other one of the slots, after the first prong has been first allocated at the bottom of the first vertical slot.

As a point of simplification and suitable for practicable purposes the separate entrances 25 and 26 of an embodiment of Fig. 9 may be replaced by a common entrance. This consideration leads to the embodiment shown in Fig. 3 etc., where the backbone 16 still confronts the two slots 27 and 28, which are curved, so that the second prong may be swung into and out of an operative position in one slot around the other, first prong seated at the bottom or end of the first slot. But the two slots merge at the top by way of a common entrance, and preferably an upward extension 29 provides a wall to the rear of the back compartment 11, as shown, in order to protect the second prong, when it is still in a swingable position, after the first prong has been lodged at the bottom of slot 27 or slot 28.

From the rear view of Fig. 4 we learn, that the spring contactors 21 and 22 may be stiffened by lugs 30 arising in the rear compartment 11 on opposite sides of the backbone 16 thus also furnishing relief for the reaction at the binding post ends 31 and 32 caused by actuation of spring contactors 21 and 22, respectively.

The compartments 11 and 12 and their covers 13 and 14 are preferably made of an insulating material, such as a plastic, and on the top side compartment 12 is provided with a circular recess 33, serving to receive the lower end of the body of tube S. Diametrically opposite circular openings 34 in the base or bottom wall of said recess 33 clear the collar C depending by way of prong P from tube S, so that such collar C may drop into the bottom compartment 12, when tube S is inserted in recess 33. From the circular openings 34 extend the arcuate slots 35, said slots clearing in width the two prongs P, thus permitting the tube S to be put, after insertion, through a so-called bayonet lock movement.

On the underside of said base or bottom wall of recess 33 extend the flat spring contactors 36 and 37, which are mounted at their fixed ends upon said binding posts, contactor 36 having, for instance, binding post 31 in common with contactor 21, whereas contactor 37 attaches to a binding post 38 at the left front of the bottom compartment 12.

Contactors 36 and 37 are slotted at their free ends, the edges of the slots registering with the circular opening 34 and with the sides of arcuate slots 35, except at 81, where they will snap over the prongs inserted therebetween.

Flat spring contactors 36 and 37 are in abutment with the underside of the bottom wall of recess 33, where the edges of their slots register with circular openings 34, and up to the projecting clawing edges 81, where said circular openings merge with said sides of arcuate slots 35. But from there, and where the edges of

said slots of the contactors 36 and 37 register with the arcuate slots 35, said contactors 36 and 37 are dropped, i. e. are curved away, out of abutment with the underside of the base or bottom wall of recess 33, these curved portions 39 and 40 being more particularly pointed out in the views of Figs. 7 and 8, respectively.

When a tube S is dropped into the circular recess 33, the collars C thereof being dropped through the circular openings 34, then the top sides of the collar C will clear the bottom sides of those portions of contactors 36 and 37, which are in abutment with the underside of the bottom wall of circular recess 33. But when the tube S is then turned in bayonet lock fashion, the top sides of collar C ride unto the curved portions 39 and 40 of contactors 36 and 37, thus being frictionally secured in position, when the prongs P reach the far ends of the arcuate slots 35, the collar C having at the same time slid into good electrical contact with the contactors 36 and 37. By a reversal of the bayonet lock movement tube S may be removed from my electric socket. Edges 31 prevent loosening by chance.

The wall portions 61 and 62, which outwardly delimit the slots 27 and 28, might be longer so that they also come closer together than shown, and that the electrical protected feature of an upward extension 29 would become unnecessary. But in the arrangement of Figs. 3–8 and 10–12 practical considerations have led to a shorter design for wall portions 61 and 62. Being short as they are, these walls 61 and 62 will clear the second prong of a tube swinging around its first prong, when such first prong is socketed at the bottom of the respective slot 27 or 28. The second prong may swing or will be swung in such fashion, for instance, when a tube is rotated around the positioned first prong for purposes of removal from the socket. Since at times considerable force is applied in such rotation, the second prong having to disengage from underneath spring contactor 22 or 21, that second prong would strike a wall 61 or 62, if such wall protrudes into the swinging path of the prong and the end of the insulated material of such wall 61 or 62 may snap or break off. The said arrangement of clearance and a provision of a protective feature like the extension 29 have therefore been found desirable.

The curving of such walls 61 and 62 in conformity with the outside of slots 27 and 28 has proved to be a feature of particular usefulness, offering a contrast with an advantage over the straight slots 25 and 26 of the embodiment of Fig. 8 or similar arrangements of the prior art: When a tube is hung, for instance from a ceiling, the opposite sockets will be in upside down position. In that case the tube relies in the first instance upon spring contactors 21 and 22 as a means for proper suspension in the inserted position, and exclusively so, if in accordance with the arrangement shown in Fig. 9, or in accordance with a similar arrangement of the prior art, the two prongs at one end of the tube may drop, straight down from the straight slots, after the respective spring contactors 21 and 22 have given way. If the tube thus swings down at one end, it will probably drop out of the opposite socket also. That cannot happen in a device of the invention, as it is for instance shown in Figs. 3–8 and 10–12. Even though on one of the sockets the spring contactors 21 and 22 might have given way, the prongs still wedge between and are locked by the converging opposite walls 61 and 62. As a matter of fact the lamp may continue in operation in such a position, as long as spring contactors 21 and 22 still engage electrically upon the prongs, although such spring contactors have ceased to be capable of mechanically retaining and supporting the prongs.

According to a customary method of wiring applied to sockets of this invention, one prong each of the tube L and of the starter tube S have a common terminal. It may prove to be of advantage, more particularly for purposes of simplification of the sockets, to allocate these prongs closer together in the socket. It may also be desirable, as an electric feature, that the circuit of the starter tube be automatically broken, if and when the tube L is not properly socketed. Thus it may prove to be of advantage, that a tube L keeps functioning, once it is in operation, although one end thereof is not retained any more by, though still in contact with the respective spring contactors 21 and 22,—as it was suggested in the preceding paragraph. In that case the walls 61 and 62 still prevent the said end of the tube to fall out, and the spring contactors 27 and 28 still are electrically engaged upon the prongs. But such faulty condition should be called to the attention of those in charge. This will be done, and the tube cannot be actuated again after the said operation has terminated, if the starter tube circuit has been broken. This will happen in connection with the embodiment shown in Figs. 10–12, where one of the slots, i. e. 28, extends slightly further at 46, but the respective prong is still retained in a level position with a prong secured at the bottom of the other slot 27, because the prong will rest in said slot 28 of the housing and 52 at its upper and lower end, respectively, which provide connecting means electrically equivalent to the prongs P of the relays or tubes shown in the other embodiments. These contact studs 51 and 52 are tensionally engaged in dents of contact lugs 43 and 50, so that current will pass between contact lugs 43 and 50 through the interposed relay or tube S, which may be replaced at will. The base 57 of the device may be suitably secured upon a support, the drawing showing for instance a slot 58 in base 57 for such purpose, in the manner similar to that illustrated in the other embodiment through which a bolt may be extended for fastening the device upon a support. The three lower ends of the spring contactors 41 and 42 and contact lug 50 are simply shown to extend from the bottom of the device for purposes of suitable connection. In accordance with the teachings of the prior art, these flat springs may of course be cut short and provided in the socket with screws serving to attach electric thereto, as it was illustrated previously herein.

Spring contactors 41 and 42 are mounted upon opposite sides and lower contact lug 50 in a recess 49 on the rear of a projection 47 in the base 57 forming part of the insulated housing. These spring contactors 41 and 42 and lug 50 are fastened by screws 45 upon projection 47. Opposite sides of base 57 may be provided with suitable clearance holes 48, through which access may be obtained for fastening screws 45 of the spring contactors 41 and 42.

For purpose of resiliency the other dented upper end of the lower lug 50 is shown to be spacedly folded back upon itself and it is shown to extend below the top wall portion of base 57.

Therefore the lower end of starter relay or lug S is first inserted to engage behind such top wall portion, stud 52 seating in the dent of lug 50, before the starter relay or lug S is swung upon a contact lug 43, which directly connects to the starter tube S, as will be hereinafter described.

Those are collateral features of an arrangement like that shown in Figs. 10–12. The principal departure from the prior art illustrated by these figures is that the starter relay or tube S is accommodated right in that portion of the socket, e. g. compartment 11, which serves to receive the prongs of the fluorescent or luminescent tube L, so that an additional compartment, e. g. 12, becomes unnecessary.

Thus a socket of the type shown in Figs. 10–12 is limited to the compartment 11 of the other embodiments. As an exemplary arrangement serving the purpose of accommodating the starter relay or tube in the fluorescent or luminescent tube portion of the socket Figs. 10–12 shows the lower extension of the backbone 16 to be replaced by a cache accommodating the starter relay or tube S. In order to provide room for such purpose, the spring contactors 21 and 22 of the previously described embodiment are replaced by spring contactors 41 and 42 which below swerve apart into close proximity with the opposite side walls of the compartments. The upper ends of these spring contactors, as well as the general arrangement of slots 27 and 28, of wall portions 61 and 62, of the extension 29, and of the cover panel 13 remain substantially the same as was described in connection with the embodiment of Figs. 3–8.

The contact lug 43, which serves to block the lower end of one of the slots, e. g. 28, is mounted in a level position below the shortened backbone 16 and a struck up ear of said contact lug 43 is suitably attached, e. g. by fastening screw 45, in a corresponding recess 44 in the rear of backbone 16.

This contact lug 43, and its counterpart, a contact lug 50 below, are suited for engaging a starter relay or tube S therebetween. Starter tube S may for instance have contact studs 51 and 52 at its upper and lower end, respectively, which provide connecting means electrically equivalent to the prongs P of the relays or tubes shown in the other embodiments. These contact studs 51 and 52 are tensionally engaged in dents of contact lugs 43 and 50, so that current will pass between contact lugs 43 and 50 through the interposed relay or tube S, which may be replaced at will. The base 57 of the device may be suitably secured upon a support, the drawing showing for instance a slot 58 in base 57 for such purpose, in the manner similar to that illustrated in the other embodiment through which a bolt may be extended for fastening the device upon a support. The three lower ends of the spring contactors 41 and 42 and contact lug 50 are simply shown to extend from the bottom of the device for purposes of suitable connection. In accordance with the teachings of the prior art, these flat springs may of course be cut short and provided in the socket with screws serving to attach electric wires thereto, as it was illustrated previously herein.

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For purposes of resiliency the other, dented upper end of the lower lug 50 is shown to be spacedly folded back upon itself and it is shown to extend below the top wall portion of base 57. Therefore the lower end of starter relay or lug S is first inserted to engage behind such top wall portion, stud 52 seating in the dent of lug 50, before the starter relay or lug S is swung from such partly inserted position S' into a fully inserted position, in which the upper contact 51 snaps into the dent in the bottom of contact lug 43.

My tests and experiments with this kind of relay have proved, that they can be made smaller than now customary, although the proportionate room provided for relay S in the showing of Figs. 10–12 is large enough to accommodate presently known sizes of such relays or tubes.

Relay or tube S is exemplarily accommodated in an insulated housing having the shape of a rectangular parallelopiped with the contact studs 51 and 52 projecting from its opposite ends. The front panel of the relay tube S of Figs. 10–12 is preferably made of light transmissive material, e. g. it is translucent or is perforated, as at 82, for the passage of light from or to the relay. It extends up as a flange 53, and when the relay tube S is inserted in the socket, the flange 53 extends partways over a depression 54 gouged out of the front of backbone 16, so that a fingernail or tool introduced into such depression 54 may be engaged underneath flange 53 for purposes of lifting the relay or tube S from the position of insertion shown, said relay or tube S first being swung to the position S', and being then withdrawn in an angularly upward direction.

Risers 56, which may be considered as bifurcations extending from backbone 16 down to the projection 47, serve as side walls for the cache in which the relay or tube S is accommodated. One of these risers is separated from backbone 16 by a horizontal groove 55, which serves as a passage for the level portion of contact lug 43, contact lug 43 resting on top of the respective riser, where a prong of a tube L is firmly socketed by the spring contactor 42, on top of such lug and at the bottom of slot 28.

The caching of the starter relay tube S does not have to be between the slots for the prongs of a tube L, but such tube S may be accommodated elsewhere, for instance below such slots, as indicated in the view of Fig. 13. But Fig. 13 also serves to indicate, that a socket of this invention may be converted for specific purposes, as they are of usefulness with special lamps or tubes as follows:

While most luminescent or fluorescent tubes issue an even glow in all radial directions, there are special tubes, which are adjusted for effectiveness in a particular direction, for instance, those which are shaped oval, half-round or the like. Fig. 13 shows that a socket of this invention may permit such a special lamp to be readily adjusted to any preferred angle. The slots for the prongs of the luminescent or fluorescent tube are, for instance, arranged somewhat upon the principle illustrated in Fig. 1, slots 83 and 84 of Fig. 13 corresponding to slots 17 and 18 of the modification shown in Fig. 1. One of the prongs of the luminescent or fluorescent tube may be rotatably socketed at the bottom of the vertical

slot 83, where it seats below the spring contactor 85 upon the lug 43, and the latter serves at its other end as a spring connection for a fuse-plug-like starter relay S. The other slot 84 is concentric to said one prong seated at the bottom of slot 83, but is shown to extend, exemplarily, over much more than a quadrant. The spring 86, which serves to allocate the other prong of a luminescent or fluorescent tube in said slot 84, extends in an arch in slot 86 and is shown to be corrugated or crimped, each corrugation on the concave side of spring 86 offering a pocket in which the second prong of a tube may be set at a preferred angle about the first prong lodged at the bottom of slot 83. A socket, which serves as a counterpart to the one shown in Fig. 13 will, of course, be symmetrically arranged.

Having thus described my invention in detail, yet I do not wish to be limited thereby, except as the state of the art and the appended claims may require, for it is obvious that various modifications and changes may be made in the form of embodiment of my invention, without departing from the spirit and scope thereof.

What I claim is:

1. A fluorescent lamp socket comprising an insulating housing having a front wall, said front wall having a pair of slots therein longitudinally curved towards each other with a radius of curvature equal to the spacing of the contact prongs of a lamp to be used therein and open ended at a common aperture at the end of the housing of a width less than the spacing of the contact prongs, a pair of spaced contacts mounted in said housing behind said front wall so as to be engaged by the lamp contact prongs when seated at the closed ends of the slots, and means for attaching circuit wires to said contacts, said slots being of a length and spaced from the side edges of the wall less than the spacing of the lamp contact prongs so that one lamp prong can be swung into one slot over the adjacent end of the housing when the other prong is seated at the closed end of the other slot.

2. A fluorescent lamp socket comprising an insulating housing having a front wall, said front wall having a pair of slots therein longitudinally curved towards each other with a radius of curvature equal to the spacing of the contact prongs of a lamp to be used therein and open ended at a common aperture at the end of the housing of a width less than the spacing of the lamp contact prongs, a pair of spaced contacts mounted in said housing behind said front wall so as to be engaged by the lamp contact prongs when seated at the closed ends of the slots, means for attaching circuit wires to said contacts, and a ridge formed on the rear face of the front wall so as to lie between said slots, said ridge having a head with sides curved concentrically with said slots and aligned with the inner edges of said slots, said contacts being laterally offset adjacent the ridge head and closed ends of the slots so as to snap over the lamp contact prongs when seated at the ends of the slots.

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